

AMENDMENT TO SPECIFICATION:

Page 5, the last paragraph spanning pages 5 and 6 is amended to read:

For some specific applications, e.g., PET with IV between 0.95 and 1.05 dl/g for manufacturing technical/commercial articles (luggage, cords, conveyor belts, etc.) or for tyre cords using PET prepolymer with a typical IV in the range between 0.55 and 0.65 dl/g, or for standard bottle applications where the initial IV of the prepolymer is ~~0.25-0.45~~ 0.25-0.45 dl/g, it is however, necessary to increase IV by more than 0.25 dl/g. This can hardly be achieved and it often cannot be achieved in a conventional plant using vertical reactors.

Page 9, the third full paragraph is amended to read:

According to the invention at least ~~[[a]]~~ one or first cylindrical, horizontal inclined, rotating around the central cylinder S axis ~~rotating~~ reactor similar to a "rotary kiln" may be used, which will be hereinafter for simplicity abbreviated as "HCIRR" referenced in the figure as 15.

Page 9, the fourth full paragraph is amended to read:

Also according to the invention, said at least one or first HCIRR reactor can be one HCIRR reactor of a series of HCIRR reactors, i.e. when the plant has a plurality of HCIRR reactors in series. Also according to the invention, said single or multiple HCIRR reactor/s can be provided upstream and/or downstream of conventional vertical reactor/s in a so-called "mixed configuration", i.e. when the plant has a plurality of both conventional vertical and HCIRR reactors in series.

Page 10, the second full paragraph is amended to read:

As the weight itself of the granules mass inside the reactor can not be ignored with respect to other forces acting as, for example the force of inertia, preferably the design and operating parameters of the reactor HCIRR 15 will be chosen so that the granules flow regime inside the reactor is characterised by a Froude Number $Fr = (\omega^2 \cdot R/g)$ comprised in the range of $1 \cdot 10^{-4}$ -0.5 ~~$\div 0.5$~~ ; where ω is the angular velocity of the

reactor; R is the internal radius of the reactor and g is the gravity acceleration = 9.806
9,806 m/s².

Page 13, fifth full paragraph is amended to read:

According to the invention, due to the reduced polymer granules bed height, thus involving reduced granules compaction pressure, said minimum degree of crystallization of polyester granules [[be]] is in the range of 0 – 70%, preferably 10% - 30%, reducing therefore the requirement of crystallisation in the provided step upstream of the reactor.

Page 14, the first full paragraph is amended to read:

Blends of various polyesters can also be solid phase polymerised in the process according to the invention. The polyester prepolymers (amorphous starting polyesters) utilized in this invention can be made in any manner but are typically prepared by conventional melt phase polymerisation techniques. These polyester prepolymers have an initial starting IV of at least about 0.2 dl/g as measured in a 60:40 (by weight): phenol [[+]] - 1,1,2,2,-tetrachloroethane solvent system at a temperature of 30°C. The rate at which polyethylene terephthalate prepolymer can be solid state polymerised also depends on the carboxyl end group (i.e. -COOH) content of the prepolymer. Generally, prepolymers having a carboxyl end group content within the range of about 18% to about 40% achieve maximum solid state polymerisation rates. It is preferred for such prepolymers to have a carboxyl end group content within the range of about 24% to 33% (see for example U.S. Pat. No. 4,238,593). Suitable polyester prepolymers which can be solid state polymerized using my invention are comprised of one or more diacid components and one or more diol components. The diacid component in the polyesters are normally alkyl dicarboxylic acids which contain from 4 to 36 carbon atoms, diesters of alkyl dicarboxylic acids which contain from 6 to 38 carbon atoms, aryl dicarboxylic acids which contain from 8 to 20 carbon atoms, diesters of aryl dicarboxylic acids which contain from 10 to 22 carbon atoms, alkyl substituted aryl dicarboxylic acids which contain from 9 to 22 carbon atoms, or diesters of alkyl substituted aryl dicarboxylic acids which contain from 11 to 22 carbon atoms. The preferred alkyl dicarboxylic acids will contain from 4 to 12 carbon atoms. Some representative examples of such alkyl dicarboxylic acids include glutaric acid, adipic acid, pimelic acid, and the like. The

preferred diesters of alkyl dicarboxylic acids will contain from 6 to 12 carbon atoms. A representative example of such a diester of an alkyl dicarboxylic acid is azelaic acid. The preferred aryl dicarboxylic acids contain from 8 to 16 carbon atoms. Some representative examples of aryl dicarboxylic acids are terephthalic acid, isophthalic acid, and orthophthalic acid. The preferred diesters of aryl dicarboxylic acids contain from 10 to 18 carbon atoms. Some representative examples of diesters of aryl dicarboxylic acids include diethyl terephthalate, diethyl isophthalate, diethyl orthophthalate, dimethyl naphthalate, diethyl naphthalate and the like. The preferred alkyl substituted aryl dicarboxylic acids contain from 9 to 16 carbon atoms and the preferred diesters of alkyl substituted aryl dicarboxylic acids contain from 11 to 15 carbon atoms.

Page 16, the last paragraph is amended to read:

The used reactor 15 is a HCIRR horizontal cylindrical inclined reactor of 1.0 meter inside diameter, 13 meters length, 2° of inclination with respect top the horizontal plane and rotating at a ~~4,4~~ 1.4 rpm speed. As purge inert gas nitrogen was used flowing downwards counter-currently respect to polyester granules flow direction. Gas circuits of fluid bed crystalliser, of reactor 15 and of fluid bed cooler 17 were isolated by means of rotary "interlocks".

Page 17, the first paragraph is amended to read:

A polycondensation test in the solid phase was carried out using polyethylene terephthalate granules containing a percentage by weight of isophthalic acid of 2.0% and a normal DTA melting point of 253.0°C. Flow rate of polyester granules was 500 kg/h. The ratio between the mass flow rate of the purge gas passing through the reactor and mass of polyester granules was = 0.95. The starting intrinsic viscosity was 0.60 dl/g. The acetaldehyde content was 75 p.p.m.. Polyester granules temperature at the reactor inlet, as well as inside the reactor, was 212°C and their average degree of crystallisation ~~crystallinity~~ X_c in the range of 39 - 40%. The polymer obtained had a final intrinsic viscosity of 0.82 dl/g keeping constant the temperature of the reactor. The average residence time of polyester granules in the reactor was 12 hours.

Page 17, the third paragraph is amended to read:

For this second example of the embodiment of the process according to the invention, all parameters of the test of the first embodiment were kept constant, except polyester granules temperature inside HCIRR reactor. The following four temperatures were used: $214^{\circ} \pm 0,5$ 0.5°C, $217^{\circ} \pm 0,5$ 0.5°C, $220^{\circ} \pm 0,5$ 0.5°C and $223^{\circ} \pm 0,5$ 0.5°C. In all those tests the average residence time of polyethylene terephthalate granules inside HCIRR reactor has been equal to 12 hours. The final intrinsic viscosity of the solid phase polymerised PET was respectively: ~~0,839~~ 0.839 dl/g, ~~0,866~~ 0.866 dl/g, ~~0,895~~ 0.895 dl/g and ~~0,932~~ 0.932 dl/g.

Page 17, the fifth paragraph is amended to read:

The same test was conducted on a conventional vertical cylindrical "moving bed" reactor with inside diameter = ~~4,6~~ 1.6 meters, bed height = 8 meters, granules velocity = ~~0,32~~ 0.32 meters per hour. Same polyethylene terephthalate granules were employed, with same degree of crystallinity at reactor inlet.

Page 17, the last paragraph spanning page 17 and 18 is amended to read:

The test run with reactor temperature equal to $216^{\circ} \pm 0,5$ 0.5°C. was successful and, in 12 hours of residence time of granules inside the prior art vertical "moving bed" reactor, it produced a product with final intrinsic viscosity = ~~0,837~~ 0.837 dl/g.

Page 18, the first full paragraph is amended to read:

The test run with reactor temperature equal to $217^{\circ} \pm 0,5$ 0.5°C. suffered beginning of polyester granules agglomeration phenomena and appeared to be the limit of the system; a product with final intrinsic viscosity = ~~0,858~~ 0.858 dl/g was produced in a residence time of 12 hours, however high product non-uniformity was observed.

Page 18, the second full paragraph is amended to read:

As soon as the temperature was increased to perform the test with reactor temperature equal to $220^{\circ} \pm 0,5$ 0.5°C, "marble-size" lumps were coming out the reactor, a positive sign of polymer sticking.

Page 18, the fourth full paragraph is amended to read:

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Attorney Docket: CAVA3001/JEK

This illustrated embodiment clearly shows that conventional, vertical, cylindrical, "moving bed" reactor presents a maximum allowable reactor temperature and maximum attainable intrinsic viscosity with a fixed reactor, bed height and bed velocity. In this specific case, the maximum allowable reactor temperature was about 216°C and the maximum attainable intrinsic viscosity was about 0.851 dl/g with a reactor bed height of 8 meters, a velocity of ~~0.32~~ 0.32 meters per hour, using a prepolymer with an intrinsic viscosity of 0.60 dl/g.